CLAIMS

We claim:

1. A method of controlling optical power for a laser in a fiber optic link where the laser is selected from among a population of similar lasers, the method comprising:

a) determining a base power level for a population of lasers using data models that characterize laser performance for the population of lasers, the models being generated from laser performance data obtained from measurements of laser properties taken from the population of lasers;

b) determining a relationship between modulation current (I_{mod}) and temperature using the data models of laser performance;

c) providing a specific laser device that is incorporated in a fiber optic link, wherein said specific laser device is selected from among the population of lasers;

d) determining a relationship between target average power and temperature for a specific laser device over a range of temperatures using the base power level; and

e) adjusting laser performance based on the temperature, target average power, and modulation current (I_{mod}).

2. The method of Claim 1 wherein the relationship between modulation current (I_{mod}) and temperature is stored in a table.

3. The method of Claim 1 wherein adjusting laser performance based on the temperature, target average power, and modulation current (I_{mod}) utilizes

measurements of an optical power level produced by the specific laser device to further adjust laser performance.

4. The method of Claim 1 wherein determining a relationship between target average power and temperature for a specific laser device includes using measurements of slope efficiency over the range of temperatures for the specific laser device and the base power level.

5. A method of establishing a trim and compensation scheme for a laser emitter in a fiber optic link where the laser emitter is selected from among a population of similar lasers, the method comprising:

a) providing data models that characterize laser performance for a population of lasers, the models being generated using laser performance data obtained from measurements of laser properties taken from a sample population of lasers;

b) determining a base power level using information from the data models and a predetermined set of user specified performance parameters;

c) determining whether the base power level satisfies a set of pre-specified operating parameters;

if a laser having the determined base power level does not satisfy the set of pre-specified operating parameters, the user specified performance parameters are adjusted and the operations of b) and c) are repeated to determine a new base power level;

if a laser having the determined base power level does satisfy the set of pre-specified operating parameters, then process moves on to the next operation d); and

d) determining a relationship between temperature and associated current values that can be used to regulate laser performance over a range of temperature.

6. A method as in Claim 5 wherein the base power level is used together with slope efficiency measurements of a specific laser and user specified optical power range window (W) to determine average target power levels thereby determining a relationship between temperature and associated average target power levels that can be used to regulate laser performance over the range of temperatures.

7. A method as in Claim 5 wherein providing data models that characterize laser performance for a population of lasers include a model that describes a relationship between slope efficiency and temperature and a model that describes a relationship between threshold current and temperature.

8. A method as in Claim 5 wherein determining a base power level b) includes using a predetermined set of user specified performance parameters including at least one of: an initial power value (P_i); a power range window (W); a temperature range; a power adjustment coefficient (PAC); a modulation current adjustment coefficient ($I_{mod\ adj}$); an extinction ratio (ER).

9. A method as in Claim 5 wherein determining whether the base power level satisfies a set of pre-specified operating parameters includes determining whether the base power level satisfies extinction ratio (ER) conditions.

10. A method as in Claim 5 wherein determining whether the base power level satisfies a set of pre-specified operating parameters includes determining whether the

base power level satisfies extinction ratio (ER) conditions at each temperature in a range of temperatures.

11. A method as in Claim 5 wherein determining whether the base power level satisfies a set of pre-specified operating parameters includes determining whether the base power level satisfies at least one of the operating parameter conditions at each temperature in a range of temperatures wherein the at least one operating parameter condition is selected from among: a maximum value for I_1, a maximum value for average current (I_{avg}), and a minimum I_{offset} value.

12. A method as in Claim 6 wherein generating a table of temperatures and associated current values includes generating a table associating a modulation current (I_{mod}) with a temperature for each temperature in a range of temperatures.

13. A method as in Claim 5 wherein b) determining a base power level includes:

i) determining modulation current values associated with a lowest temperature in a range of temperatures;

ii) determining modulation current values associated with a highest temperature in the range of temperatures;

iii) determining logical "1" current values associated wherein the logical "1" current values are associated with the with a highest temperature in the range of temperatures; and

iv) determining the base power level using information associated with: the determination of modulation current values in i); the determination of modulation current values in ii); and the determination of the logical "1" current values in iii).

14. A method as in Claim 13 wherein determining a modulation current values associated with a lowest temperature in a range of temperatures includes:

determining best case slope efficiency values taking in to account error margin and coupling efficiency; and

calculating modulation current value associated with a lowest temperature in the range of temperatures using the best case slope efficiency values.

15. A method as in Claim 13 wherein determining a base power level includes:

determining logical "0" current values;

determining offset current values;

using the offset current values and user specified performance parameters to determine a base power level.

16. A method as in Claim 15 wherein determining a base power level includes:

determining logical "0" current values by using the logical "1" current values determined at the highest temperature in the range of temperatures and using corresponding modulation current values determined at the highest temperature in the range of temperatures;

determining offset current values by subtracting the logical "0" current values from a corresponding threshold current value determined from a data model;

using a minimum offset current values and other user specified performance parameters to determine the base power level.

17. A method as in Claim 5 further including the further operations of:

e) trimming a specific laser emitter in a optical link using the base power level together with slope efficiency measurements of the specific laser over a range of temperatures to a determine target average power level for each temperature in the range of temperatures thereby defining a relationship between temperature and the associated target average power levels that can be used to regulate laser performance over the range of temperatures;

and

f) compensating for the effects of temperature by using the relationship between temperature and associated current and associated target average power values to regulate the laser emitter performance as temperature changes.

18. An optical link including a laser emitter in optical communication with an optical fiber wherein the optical link implements the trim and compensation scheme described in Claim 17.

19. The optical link as in Claim 18 wherein implementing the trim and compensation scheme comprises:

detecting optical power produced by the laser emitter; and

wherein compensating for the effects of temperature using the relationship between temperature and associated current and associated target average power values further includes using the detected optical power to regulate the laser emitter performance.

20. A optical link suitable for coupling with an optical fiber in the optical link, the link comprising:

an optical fiber;

a semiconductor laser emitter in optical communication with the optical fiber;

a monitor element for measuring the optical power produced by the semiconductor laser emitter;

temperature sensor for detecting the temperature of the semiconductor laser emitter and producing an sensor output signal associated with the detected temperature;

memory having stored values for current information associated with temperature; and

laser driver circuitry for receiving temperature dependent current information from the table and using said current information to provide a driving current to the semiconductor laser emitter so that the laser emits an optical signal having a desired optical power.

21. The laser emitter device of Claim 20 wherein the memory has stored therein values concerning a relationship between temperature and target average power.

22. The laser emitter device of Claim 20 further including electronic circuitry for calculating target average power values based on a calculated base power value and slope efficiency measurements of the semiconductor laser emitter thereby determining a relationship between temperature and target average power for the semiconductor laser emitter.

23. The laser emitter device of Claim 22 wherein the memory includes a look-up table having stored values concerning a relationship between temperature and modulation current (I_{mod}) that can be used to provide a desired temperature dependent regulation of modulation current.

24. The laser emitter device of Claim 23 wherein the temperature sensor detects the temperature of the semiconductor laser emitter; and

wherein the look-up table provides the laser driver circuitry with temperature dependent modulation current information that provides a driving current to the semiconductor laser emitter so that the laser emits an optical signal having a target average power for the laser emitter at the current temperature.

25. The laser emitter device of Claim 23 wherein the temperature sensor detects the temperature of the semiconductor laser emitter; and

wherein the look-up table provides the laser driver circuitry with temperature dependent modulation current information;

wherein the temperature compensation circuitry provides the laser driver circuitry with temperature dependent target average power information;

wherein the laser driver circuitry receives the temperature dependent modulation current information and the temperature dependent target average power information and therefrom determines a driving current which is provided to the semiconductor laser emitter so that the laser emitter emits an optical signal having a target average power for the laser emitter at the current temperature.

26. The laser emitter device of Claim 25 wherein the temperature compensation circuitry is configured to compensate for changing threshold current (I_{th}) values.

27. A optical link suitable for coupling with an optical fiber in the optical link, the link comprising:

an optical fiber;

a semiconductor laser emitter in optical communication with the optical fiber;

temperature sensor for detecting the temperature of the semiconductor laser emitter and producing an sensor output signal associated with the detected temperature;

memory having stored values for current information associated with temperature; and

laser driver circuitry for receiving temperature dependent current information from the table and using the information to provide a driving current to the semiconductor laser emitter so that the laser emits an optical signal having a desired optical power.

28. The laser emitter device of Claim 27 wherein the memory includes a look-up table having stored values concerning relationships between temperature, modulation current (I_{mod}), and the current required for to produce a logical "1" (I_l) that can be used to provide a desired temperature dependent regulation of modulation current.

29. The laser emitter device of Claim 28 wherein the temperature sensor detects the temperature of the semiconductor laser emitter; and

wherein the look-up table provides the laser driver circuitry with temperature dependent modulation current information that provides a driving current to the

semiconductor laser emitter so that the laser emits an optical signal having a target average power for the laser emitter at the current temperature.